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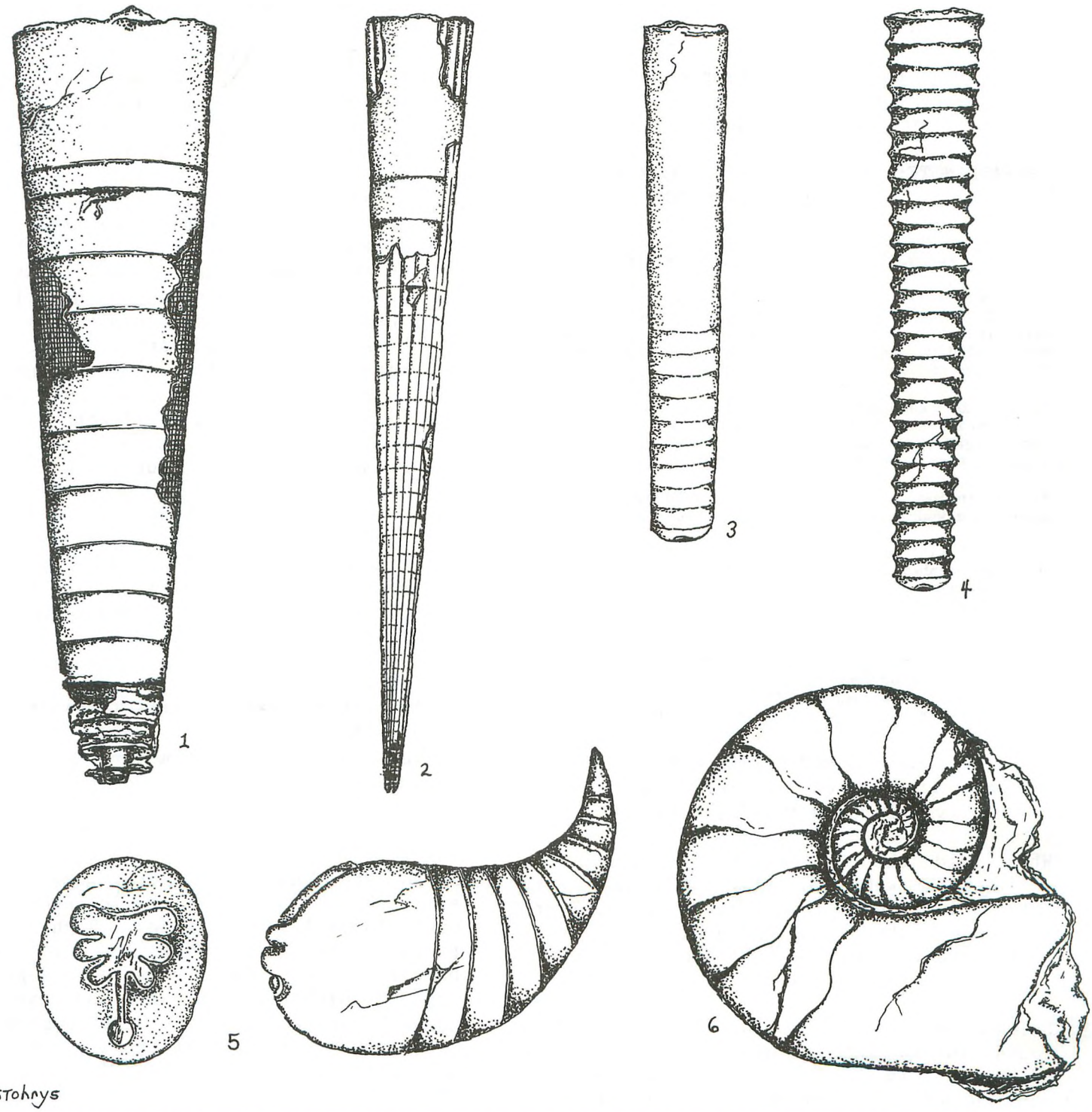

A LOVE OF FOSSILS BRINGS US TOGETHER

MARK YOUR CALENDARS

6 NOV MAPS MEETING. Augustana College, Rock Island, IL.

1:00 Board & General Meeting combined.

15 APR 1994 MAPS NATIONAL FOSSIL
16 EXPOSITION XVI
17

Fri., Apr. 15: 8am - 6pm
Sat., Apr. 16: 8am - 5pm
(Business meeting and auction following)
Sun., Apr. 17: 8am - 3pm

PLEASE NOTE: THE DATES ARE INCORRECT IN THE 1993 DIRECTORY

***** 93/10 & 93/11 DUES ARE DUE *****

Are your dues due? You can tell by checking your mailing label. The top line gives the expiration date in the form of year followed by month--93/10 means 1993/October. Dues cover the issue of the *Digest* for the month in which they expire.

We do not send notices but will let you know if you are overdue by highlighting your mailing label on your *Digest*. We carry overdues for two months before dropping them from our mailing list.

Please include your **due date** and **name exactly as it appears on your mailing label**--or include a label.

Dues are $15 per U.S./Canadian household per year. Overseas members may choose the $15 fee to receive the *Digest* by surface mail or a $25 fee to receive it by air mail. Library/Institution fee is $25.

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4800 Sunset Dr. SW
Cedar Rapids, IA 52404

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HOW OLD ARE SPIDER WEBS?

from *Coastal Waves* 4/90, via *Tumbler* 3/93 via *Dinny's Doin's*, 8-9/93

When did the spider first acquire the ability to weave webs? No one knows yet, but Paul Selden, researcher at the University of Manchester in England, has evidence that spiders could weave orb or radial webs as long ago as 140 million years.

Selden studied four tiny fossil spiders found in two Spanish quarries...each piece of spider looks like a little brown flake just under the surface of the translucent rock, he says...and found they had 'accessory claws' that modern spiders use to weave a web. The age of the orb weavers turns out to be many years earlier than any previously known.

Scientists have discovered fossils of spiders that could spin silk threads almost 400 million years ago. Such spiders probably used the silk to line their burrows or as aids in sensory perception. The Spanish spiders are the earliest known that could weave the common orb web, one that hangs in the air and traps the flying insects that are the spider's prey.

ABOUT THE COVER

This month's cover drawings and descriptions were sent by Jim Kostohrys, Des Plaines, Illinois. The nautiloids illustrated were found in the Silurian Niagaran formations in the Castle Rock Flagstone Quarry, Lemont, Illinois. ***(See story on pages 3-6.)***

1. *Protokionoceras*--usually poor detail of outer shell's pattern which seems to have a "matte" texture. A large robust Nautiloid with a large siphuncle. Tips of shell are poorly preserved. 66.14 cm. length.
2. *Kionoceras*--the most commonly found Nautiloid. Shell surface is ribbed and fluted; the end of the cone is usually crushed or collapsed. Specimen measures 81.28 cm. length.
3. *Leurocycloceras*--a rare Nautiloid which seems to have a large siphuncle and an impossibly long living chamber. 45.72 cm. length. Specimen broken on both ends and incomplete.
4. *Dawsonoceras*--often found crushed in these deposits, *Dawsonoceras* has a beautiful frilled shell with a rather small siphuncle. Length 55.88 cm.
5. *Hexameroceras*--a curved Nautiloid whose occurrence in the quarry is rare. Drawing shows apertural and lateral views. Apertural view is taken from other drawings and restorations. 12.7 cm. in length.
6. *Gigantoceras*--often found with a long living chamber intact. A large Nautiloid; some specimens measuring 40 cm. across.

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FROM THE EDITOR

As you will notice, this month's issue of the *Digest* is a double issue. Time commitments to my family and children's activities kept me too busy to do a separate October issue, so we decided to make up for it with this issue.

Well, January is only two months away now and with it comes the information on registration and travel and housing for EXPO. Maggie Kahrs is once again the EXPO *Digest* editor. The theme for this EXPO is Dinosaurs. Contact Maggie if you can contribute an article.

We hope you are all keeping up with the proposed legislation concerning fossil collecting and contacting your Congressmen with your opinions. The future of amateur collecting may be greatly affected by this legislation.

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LETTERS TO THE EDITOR

Dear Editor:

The Baucus paleontology bill, S-3107, introduced into Congress last year by Senator Max Baucus (D,MT), will cause many problems if it becomes law.

The bill attempts to preserve our heritage of ancient fossils by preventing their collection by all but a tiny cadre of professional paleontologists. Those favored few scientists would get the job of collecting, preparing and studying fossils of vertebrate creatures.

Senator Baucus, who wants to regulate and control paleontological collecting on public lands, appears to be unaware that noncollection of fossils does not equal preservation of fossils. Wind, rain, ice and other forces which erode the earth and expose fossils also destroy fossils within a few years of exposure. Fossils left exposed to the elements soon crumble into worthless chips and gravel and are lost to science and everyone else.

Senator Baucus wants to keep you off of your public lands for fossil collecting. His bill would authorize hiring an army of bureaucrats at enormous expense to us taxpayers to be fossil police. The bill is loaded with fines, forfeitures, prison terms and general nastiness.

If you just pick up a bit of dinosaur bone, you could be fined $100,000, go to prison for five years, and forfeit your car. A teacher who used a vertebrate fossil in science class could be fined and sent to prison is the fossil is damaged during classroom use. The standard school geology field trip could result in felony charges and prison terms for the teacher, students and bus driver.

S-3107 does not distinguish between rare or valuable vertebrate fossils and other fossils, such as shark's teeth and conodonts, which are abundant in many rocks. Fossil fish scales or teeth could place entire rock formations off-limits, shutting down industries such as phosphate rock mining, cement production, and quarrying of building stone. Even coal mining could be stopped.

American Lands Access Association (ALAA) has drafted its own bill which protects fossils. The bill is reasonable in its approach and emphasizes education over enforcement. The great majority of people in the rockhound and geoscience community back the ALAA bill.

William F. Jud, Geologist
Fredericktown, MO 63645-9325

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WHALE'S ANCESTOR A DOG?

source: *Chicago Tribune*, 4/4/93
sent by Gerry Norris

Discoveries of 50-million-year-old fossils have led Duke University paleontologists to believe that the ancestor of the whale is a doglike creature called Pakicetus. The animal's fossilized ear and jaws indicate it had a type of hearing adapted for use on land and in water. Hans Thewissen, in a report in the British journal *Nature*, says that suggests the creature was evolving into a marine mammal.

According to Thewissen, the fossils indicate that living animals closest in ancestry to modern whales are deer, cows, pigs, camels, giraffes and other hoofed animals with even numbers of toes.

SILURIAN NAUTILOIDS FROM CASTLE ROCK FLAGSTONE QUARRY
Lemont Illinois
by Jim Kostohrys, Des Plaines, Illinois

Fossil Evidence of Ancient Undersea Conditions

For the past twelve years I have been collecting fossil megafauna from the flagstones near Lemont, Illinois. These deposits consist of Silurian Niagaran formations that were probably laid down in a shallow bay or lagoon.

Most of the fossils collected there are various species of Nautiloids. However, other fossils are found within the deposits and because of their condition or rarity, and along with preservation characteristics of the Nautiloids, I have concluded that the conditions consisted of shallow waters with considerable wave action and shifting sediments.

Only a few corals have been found in this quarry. They all are preserved as pieces broken off of a larger mass. Corals are rather common in many of the area's quarries, but I have not been able to find any reef structures within the flagstone area. Only one sponge (*Astraeospongia*) has been recovered. Preservation of the fossil sponge was poor.

Several species of brachiopods are found, and these all appear to be small "seed" brachiopods washed in and quickly overwhelmed and buried by the sediments. Trilobites are not rare, but tend to be poorly preserved. I have collected complete *Calymene* and pieces of *Dalmanites*, *Bumastus* and *Sphaerexochus*.

Worm burrows are common in some layers and completely absent in others. There is no soft bodied preservation apparent.

Crinoid stems and an occasional partial calyx are rarely found. No root system has been discovered although *Eucalyptocrinus* seems to be the most commonly occurring local species, known for its considerable holdfast system preserved in nearby areas.

The above fossil evidence seems to indicate an area with too much turbulence to allow sessile creatures a chance to get a foothold. Probable scavengers like worms and trilobites seem to have fared better.

The most common fossils in this area are the nautiloids, straight, curved and coiled types. For a long time I was puzzled by the number and the diversity of these fossils and also by their preservation. All are fossilized with only the bottom portion of the shell preserved. To find the fossil Nautiloids, you must pry up layers of rock and look underneath to find the fossil shell clinging to the underside. Sometimes, especially in more massively bedded layers, the shells are almost complete and round, but in others, there may be only a small section, less than 25% left, as if the shell was sawed longitudinally from end to end. Tips of the straight Nautiloids are poorly preserved and are often in a collapsed state.

A number of paleontologists have suggested that the shells of dead cephalopods continued to float for some time and could have been distributed to areas where the animal would not have lived. I think such is the case here.

Although there were trilobites to feed on, there is not as great abundance and the wave action and sediments would not have suited the straight or coiled cephalopods maneuverability.

I have found a number of smaller curved species in nearby reef formations where they appear to be common. Occasionally, one is found in the flagstone deposits. I believe most, if not all, of the curved species floated in from outlying reefs.

In some deposits, notably the Cambrian of Wisconsin, tapered fossil shells like *Hiyolithes* are all arranged facing one direction, indicating prevailing currents. The straight nautiloids are facing every direction, even when on the same bedding plane. I have a couple of fossil "twins" with one cone facing the opposite of the other with only a small amount of matrix between. This seems to also be an

indicator of turbulent wave action. Lastly, there is an abundance of broken pieces and even single chambers. One particularly fine specimen shows a straight cone broken in half and fossilized preserving both halves while another coiled specimen has a portion of a straight species jammed in its living chamber. All this evidence seems to support rough waters, and already dead nautiloids washed in from another area.

The Castle Rock Flagstone Quarry has been, and continues to be, a fascinating area to study. Sediments are pried up layer by layer, much of the work being done by hand. This has greatly enabled me to observe features and characteristics of the deposits and to draw probable conclusions as to the conditions which they were laid down.

See illustrations on cover and next page.

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FOSSIL CLEANING

from Backbender's Gazette, 11/92
***via Paleo Newsletter*, Jean Wallace, ed.**
1-2/93

Two goals of fossil cleaning are removal of the dirt and rock attached to the fossil and elimination of stains and discolorations, if possible. Loose dirt can simply be removed with soap (detergent) and water with the use of a brush, such as a toothbrush. Never use a wire brush since it is harder than most fossils and will leave scratches. Attention must be given to the specimen's state of preservation so it remains intact during the cleaning process!

If after washing and brushing, the specimen still has unwanted matrix, the following steps may be tried. The list is arranged in order of increasing severity.

BORAX OR BAKING SODA. Some clays may be removed by boiling in detergent, borax or baking soda.

VARSOL-WATER. Most clays and shales will absorb water, causing swelling or expansion. Follow these steps: (1) Heat the specimen, preferably above 200 degrees F., to evaporate our all water between the clay particles and continue heating to drive off some of the water of hydration; (2) Place the still warm fossil in Varsol (kerosene is smelly and not as effective) and leave until the Varsol has penetrated all of the clay (several hours or even days); (3) Pour off the Varsol and immerse the fossil in water (hot, if possible). Varsol acts as a wetting agent and fills the pores but will not be absorbed by the clay. As water replaces Varsol, swelling spreads clay particles apart so they slough off; (4) Scrub with soap (detergent) and a toothbrush to remove remaining matrix; (5) Repeat from Step 1 as many times as necessary.

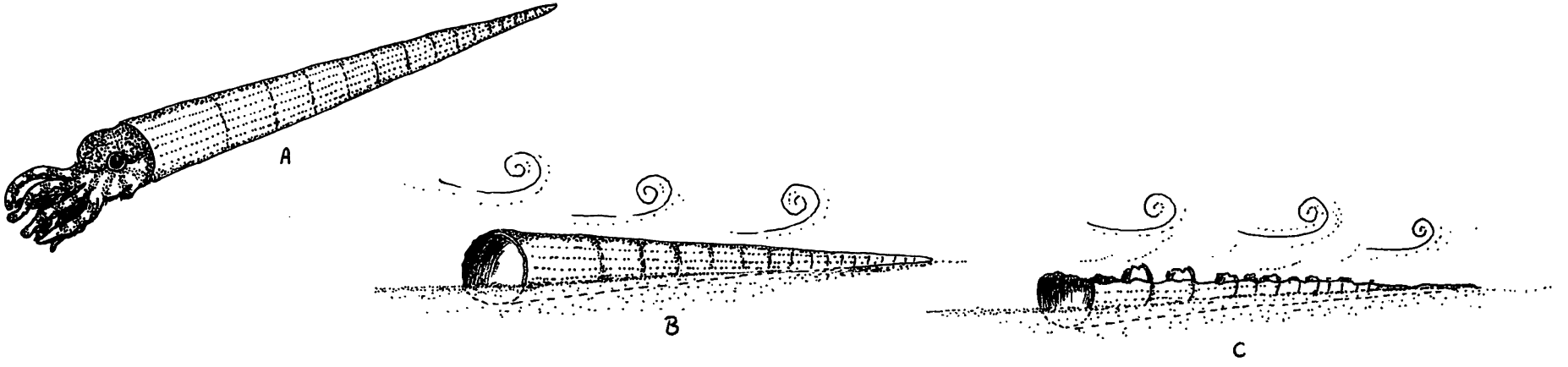
TSP. Some clays are partially cemented or nonswelling and require other treatment. Try boiling specimens in Trisodium phosphate (TSP).

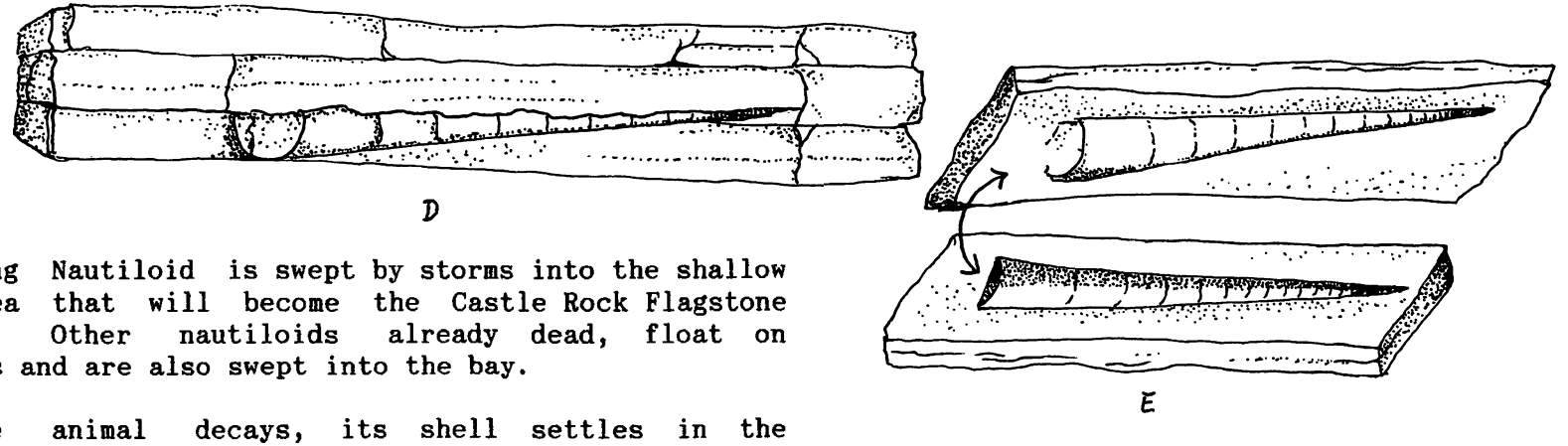
HYDROGEN PEROXIDE. An ionic bond exists between some clay particles and may be disintegrated by breaking the bond. Try soaking the specimen in a 1-3% hydrogen peroxide solution. Do not soak too long or use higher concentrations because the soaking can etch or discolor the fossil.

ACID. Hard limestone will not respond to the above treatments. A last resort method is careful use of a very dilute acetic acid (vinegar is a very weak solution). Apply to a small area with a fine brush or toothpick and neutralize with water and bicarbonate of soda before damage is done to the specimen.

Ed. note: Fumes from some of the above-mentioned cleaners may be harmful. Be sure you have adequate ventilation or use them outside.

POSSIBLE FOSSILIZATION PROCESS:





A. A living Nautiloid is swept by storms into the shallow bay area that will become the Castle Rock Flagstone Quarry. Other nautiloids already dead, float on currents and are also swept into the bay.

B. As the animal decays, its shell settles in the sediments. Parts of the shell remain above, exposed to wave action and abrasive sand particles carried by currents.

C. Top part of shell is worn away. Chambers fill with sediment. Tip of shell is completely buried and does not fill with sediment but remains hollow.

D. Sediments are buried along with the remaining Nautiloid shell. Pressure causes sediments to harden into rock. Hollow tail section collapses while remaining chambers, filled with sediment retain their form.

E. Quarry workers expose the fossil by hand-prying layers of flagstone. Shell found clinging to underside of slab while negative is part of the quarry floor.

FLUORESCENCE IN FOSSIL MOLLUSCS

by Wayne S. Barnett
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Abstract

Fossils with fluorescent color patterns and muscle scars are reported in Cretaceous to Recent aged rocks. Although fluorescence on fossils has been reported over the past fifty or more years, application of the phenomenon as a taxonomic tool has been very limited. A ready method to enhance the fluorescence is redescribed. The factors that cause fossils to fluoresce are unproven, although work done on fluorescent minerals suggests that activator compounds cause fluorescence. These activator compounds probably become locally concentrated in the shell material as part of the carbonate structures as the shell is produced by the muscle. The fluorescent color pattern on the shell surface is probably activated by the same mechanism.

Introduction

The discovery that some fossils fluoresce was made independently by several investigators in the late 1920's. It was also discovered in the late 1930's and early 1940's that muscle scars and pallial lines of bivalves fluoresce and that the color pattern of molluscs may be enhanced by ultraviolet (UV) light (Rolfe, 1965). Recently several investigators have used fluorescence to help identify and separate closely related species in the fossil record (Hoerle, 1976; Vokes and Vokes, 1968; Barnett, 1981). It has been suggested by Rolfe (1965) that an inspection of all fossils under UV light be considered a routine paleontological test.

The reasons that the shells of molluscs fluoresce may be complex. However, inorganic activator compounds are believed to be responsible for calcite and aragonite, the material that their shells are made of, fluorescing (Gleason, 1960). "Manganese, they proved, is an activator in many calcites, crystalline limestones, and dolomites. The greenish fluorescence seen in aragonites seemed activated by strontium." (Gleason, 1960 p 215). Gleason also discusses how, with additional research, it was found that many fluorescent colors were caused by more than one impurity in the mineral. In no case was it documented that minerals with an uncontaminated mineral composition, i.e. no activator elements, fluoresced.

Fluorescence is caused by the conversion of UV light to visible light by activator compounds (Rolfe, 1965). A source for those elements that induce fluorescence in fossil and modern molluscs should be determined. The composition of seawater remains rather constant at any particular time. Magnesium is present as a major conservative element, and in modern seas is present in concentrations of 0.13% by weight. Strontium is present in concentrations of 0.001% by weight (Goldschmidt, 1964).

Woodbridge (1961) reports the widespread occurrence of fluorescence in modern marine and nonmarine shells. The marine gastropods had more representatives than any other group of molluscs and most of these were marine species. All molluscs studied during this investigation lived in a marine environment.

When compounds that have UV activator elements are exposed to UV light, electrons in the outer valence shells of the atoms are excited and move to a higher, less stable, level. Even with continued input of UV light the electrons cannot retain their unstable orbit and as they return to their stable orbit when some of their acquired energy as light. It is this light that is seen as fluorescence (Mousseron and Mani, 1972).

The color that the living shell produces is partially determined by the diet of the animal. The particular color pattern that a shell exhibits may also be influenced by different ecological factors. The basic color pattern of the shell, however, is genetically determined, and therefore should be considered a taxonomic trait for the identification of species. The color

pattern records the production and deposition of pigments that are produced by the mantle. The placement of these cells in the mantle is determined by genetics and, as the shell grows, produces a pattern. However, the intensity of the color may be influenced by the rate the shell grows (Krueger, 1974).

Until the mid 1960's paleontologists depended on the shell's ability to fluoresce naturally. Axal A. Olsson of Coral Gables, Florida, began trying various chemicals to enhance the brightness of fluorescence in fossil molluscs. He discovered that common household bleach (Clorox) not only enhanced fluorescence, but induced it in previously nonfluorescent specimens. Chlorine bleach is readily available and is considered harmless to shells. It has been found that the stronger the bleach solution, the shorter the period of soaking has to be in order to induce fluorescence. Some specimens show their color patterns as light brown areas, without UV light, after bleaching (Krueger, 1974).

Procedures

In order to test the hypothesis that the origin of the fluorescent color pattern originates in the living animal, the collection of modern molluscs at the University of California, Davis (UCD) was inspected under a standard longwave UV light. If no modern specimens were found to have a fluorescent color pattern, it would be unreasonable to conclude that the fluorescent pattern was acquired during the life of the animal and would match the pattern of the living specimens. Specimens found to have a fluorescent pattern were noted for further study. The fluorescent colors that were observed varied from pale yellow to carmine. Less than 20% of the lots inspected were found to be fluorescent. In addition to the color pattern fluorescing, the muscle scars and pallial lines of several bivalves were also found to fluoresce. The observed fluorescence of the color pattern or muscle scars did not seem to have any relationship to the collection site, taxonomic group, or maturity of the specimen. Specimens from worldwide locations were inspected, and fluorescent specimens were found from a variety of these locations. In several lots that had a fluorescent pattern, the degree of fluorescence varied greatly within the lot.

In addition to the collection of modern molluscs at UCD the fossil collections of Mr. W.D. Pitt, and the author's were searched for specimens that showed a fluorescent pattern. In those lots that had specimens that were fluorescent, the entire lot was set aside for additional study. Additional fossil material was selected based on the presence of a color pattern in the specimen's modern descendents. All fossil specimens were soaked for one to seven days in common household bleach, rinsed in water, then inspected under UV light. Specimens were chosen that were not heavily leached and would not fall apart when soaked in a aqueous solution. The age of the specimens chosen for this study ranged from the Cretaceous to the Recent from worldwide locations.

Two specimens of Glycymeris--fossil , Yorktown Formation, Virginia and modern, location unknown--were sectioned through the muscle scar and analyzed by microprobe. Both the muscle scar and surrounding shell were analyzed for trace elements. Samples of muscle scar and surrounding shell were also inspected under a petrographic microscope to determine the mineralogical composition of the shell material.

In order to efficiently record the fluorescence that was observed, a photographic procedure was developed. These methods were based on published methods of previous authors reporting fluorescence in fossils and standard photographic methods. All specimens were photographed in a dark room with only UV light illuminating the specimens. The use of photographs made it easier to study the specimens rather than having to use a darkened room each time the material was inspected.

Observations

Specimens from many worldwide locations and various stages of maturity were used for this study. Not all of the modern

specimens fluoresced. The modern specimens that did not fluoresce may have had their ability to fluoresce masked or blocked by one or more factors. At present these factors are unknown. Specimens that showed a color pattern under UV light ranged in age from immature to mature specimens. Specimens from many locations were found to have at least some fluorescence. Bleaching the modern specimens in order to enhance the fluorescent patterns was not carried out since the color patterns of modern specimens are already readily visible.

Many fossil specimens soaked in household bleach had their color pattern enhanced when observed under UV light. The brightness of the fluorescence did not appear to increase when soaked more than three days. The optimum time in the bleach, in fact, appeared to be two to three days. In almost all cases the fluorescence was activated or enhanced after the fossil specimens were bleached. The color of the specimens was usually lighter after being soaked in bleach. This may be a result of the removal of residual organic material in the shell. The solution and leaching of the organic material from the fossil shells may be the reason for the brighter fluorescence after soaking. The brightness of the fluorescence did not seem to vary with the age of the specimen or location collected. While the oldest specimens studied in this investigation were Cretaceous in age, that does not imply that specimens older than Cretaceous will not fluoresce.

Many fossil species chosen for this study were based on the presence of a color pattern in their modern descendants. The pattern that was found in these fossil specimens was the same as that of the modern specimens. This was an expected result. If the color pattern had been different in fossil and modern specimens of the same species, the use of color pattern as a taxonomic tool would be invalid. It should be noted, however, that color patterns may change over periods of time, like other taxonomic traits. For this reason, color pattern must be used with as much care as any other taxonomic feature.

The samples of the muscle scar and normal shell material that were inspected with a polarizing microscope were found to be aragonite and calcite respectively. This was the case for both modern and fossil specimens.

The results of the microprobe analysis showed the presence of trace amounts of magnesium and strontium carbonate. Only the muscle scar areas showed any measurable amounts of these elements, however. Microprobe analysis was not carried out on the color pattern areas because they could not be isolated crystallographically. The results of the analysis on the muscle scars are as follows:

Glycymeris sp. Yorktown Formation, Miocene, Virginia

Area	CaCO3	SrCO3	MgCO3	Total
1	97.30	0.24	0.19	97.46
2	96.21	0.91	0.13	97.25
3	96.90	0.22	0.03	97.15

Glycymeris sp. Modern, Location unknown

1	96.39	0.23	0.11	96.73
2	96.51	0.84	0.06	97.41
3	96.87	0.24	0.02	97.13

The average concentration of strontium in the muscle scar area was found to be over 300 times the concentration of strontium in seawater, the concentration of magnesium was 0.70 of seawater, and both are carbonates in the shells. They appear to be concentrated only in those areas where there is a direct attachment of the animal to its shell.

Conclusions

This study supports the conclusion of previous authors that color patterns in fossil molluscs can be detected or enhanced in fossil specimens and therefor be used to help separate species in the paleontological record. The use of this technique should not be used as an absolute tool, however, since the color pattern in modern species has been observed to be variable. A change in environment, diet, or other factors may change the pattern that is recorded in the shells of many modern molluscs. The color pattern that is

displayed should be used as an additional tool with other taxonomic features of each species being studied. The use of color patterns is most useful in those groups where the species have a unique color pattern.

The use of the fluorescent pattern that is displayed for the muscle scars and the pallial lines may be used to advantage with specimens of the bivalvia when these features are difficult to see in small and/or weathered specimens. In this case the use of fluorescence is used to observe taxonomic structures that may otherwise be difficult to distinguish in fossil shells.

After long periods of burial, the ability of molluscs to fluoresce seems to be lost. After specimens have been exposed to sunlight or chemically treated, the ability to fluoresce is sometimes regained. This is illustrated by fossils that are found partially exposed on the outcrop. The portion exposed to sunlight shows the color pattern under UV light, and the buried portion shows no fluorescent pattern. Also, specimens that are found partially exposed on the outcrop often have a darker color on the the buried portion of the specimen. The darker color may be attributed to the presence of carbonized organic material. This theory may be supported by the observation that after specimens are bleached, they are a much lighter color.

The analysis of the mineralogy of the shell material indicates that the aragonite of the muscle scar may not readily convert to calcite. This may be because of the presence of the trace elements in the shell. The observation that the fluorescence was found in the muscle scars and pallial lines of the clam, which have no apparent color pattern of other dyes that are readily detected, supports the observations of the mineralogists that fluorescence is caused by inorganic trace elements, deposited during time of shell formation and not by organic activators as suggested by previous authors. It may also be concluded that concentration of fluorescent activators in all parts of the shell is biologically controlled. This indicates that the fluorescence in the pallial line and the muscle scars is probably activated by these trace elements.

If there is a biological concentration of the activators in the muscle scars, then there is probably a biological mechanism within the areas that deposit the color pattern that concentrates activator compounds in these areas. In fact, it would be unreasonable to conclude that the fluorescence originated any other way. If fluorescence that is observed in shell color patterns had any other origins, the pattern of fluorescence may not be in the pattern of the colors on the live shells. If the origins of the fluorescence activators was from mineralization after death and burial, the fluorescence would probably be random or non-existent.

Additionally, if the color pattern was activated by the organic deposits in the shell, it would be expected that the fluorescent pattern would be present in all of the specimens in a lot that showed some fluorescence. This is not the case. In fact, it was observed that the fluorescence that was observed in some specimens in the same lot varied greatly. In some cases it also appeared that the coloring material had an UV absorptive property.

This leads me to the conclusion that the fluorescence that is observed in fossil molluscs is caused by the activator compounds that are deposited in shell material at the time of shell deposition. Even though the shell area where the pattern was observed was not analyzed because of lack of crystallographic differentiation, I do not think it reasonable that the fluorescence in one part of the shell is caused by one mechanism and a different mechanism is responsible for the fluorescence in another part of the shell.

Suggestions for additional research

If anyone is interested, either professor student, in delving into this problem, please use these ideas as a starting point. I would suggest, if I might, to do additional microprobe analysis on shells in areas where there is a color pattern on both modern and fossil specimens. It may turn out that differences in the concentration of trace compounds may be

detected even though the structure may not be easily separated mineralogically. Exposure of modern and fossil specimens to UV light for long periods to bleach the shells and to possibly bleach the specimens as they would be on an outcrop surface. Extend this work to other groups that show a color pattern in the fossil and modern record. Groups such as the cephalopods and brachiopods.

The Photographic Technique

When photographing fluorescent color patterns, most cameras in which the image may be directly viewed and focused may be used. Film sizes from 35 mm to 4/5 or larger may be used. Cameras that use these sizes of film include single lens reflex cameras (SLR) and view cameras. These cameras allow accurate focus of the specimen. This is particularly important when the specimens are small and the camera-to-specimen distance is short. This is particularly true when a macro lens or extension tubes are used.

A set of extension tubes or a macro lens should be used with the camera when photographing small specimens. The use of either or both of these gives the ability to magnify the image on the negative. If both are used, the ability to magnify the size of the image on the negative larger than life size is possible. Under such conditions, the depth of focus is usually very shallow. Of the two methods used to enlarge the original image, the macro lens is usually the best choice. The macro lens has a continuous range of focus, and many of the brands available may be focused from infinity to near 1:1. This feature becomes important when shells of different sizes are to be photographed in the same session. After the camera is positioned at the approximate position so that the image will fill the negative, the lens can be easily focused. If extension tubes are used, the proper length will need to be chosen and then the lens focused. Another advantage of the macro lens is that it is designed for close-up work. A standard lens with extension tubes is better than no magnification, but not as good as most macro lenses.

A yellow filter used over the front of the lens is required to prevent the UV light overexposing the film. This is only required when using black and white film. Film is usually very sensitive to UV light and will become over-exposed before the fluorescent pattern is recorded. Do not use a yellow filter for color film; it will give the photograph a yellow cast. Photographs made with color film and no filter will usually have a blue color for the background, and the color pattern will be a light yellow.

The UV light source should be the longwave type and at least 20 watts of power. The wattage may be divided into two lamps or, if placed correctly, one may suffice. UV lamps used for viewing fluorescent minerals will usually be sufficient to look for the fluorescent patterns in shells.

A tripod or copy stand to hold the camera steady during the long exposures is necessary. A copy stand is usually better because the upright that holds the camera is attached to the base where the specimen is placed to be photographed. This helps make the camera and stand assembly less likely to be moved or vibrated during the photographic session. Tripods have legs that can be more easily bumped and are not as usually well secured as the copy stand. Except for more expensive models of tripods, it may also be difficult to get the camera and specimen properly positioned for the photograph.

A stand for the UV light(s) will also be required. The light will need to be held a constant standard distance from the specimen so the exposures will be consistent. If the light source distance is changed for every exposure, quality photographs will be difficult to obtain.

A locking cable release will hold the shutter open during long exposures that are usually required. In addition to keeping the shutter open, the cable release will help prevent movement of the camera while opening and closing the shutter.

For the background a board painted flat black is usually the best choice. Such a background will show no shadows or reflections to detract from the shells being photographed.

The type of film used will depend on the use of the photographs. Most photographs can usually be made on standard black and white film. Daylight color slide film can be sued instead if the photographs are to be used for presentations or slide shows. The original black and white negatives can also be used for projection when placed in slide mounts. The film used should be as fine grained as possible. Films with an ASA rating of 25 to 125 should be used in both black and white and color work. These films require longer exposures, but the detail they are able to record offsets the problem of the longer exposure.

The use of a timer of some type is required for accurate standardized exposures. The use of a stopwatch in a dark room may be difficult. One alternative is to use a darkroom timer so that the UV lights can be plugged into the timer and at the end of the exposure the timer will turn off the UV lights.

The Exposure

Determining the best exposure to use to record the fluorescent pattern is achieved by making a series of bracketed test exposures. The proper exposure is determined by the brightness of the fluorescence, aperture of the lens, film speed, and amount of magnification of the image on the negative. The brighter the fluorescence, the shorter the exposure if all other factors remain the same. When the UV lights are placed close to the specimen, the brightness is maximized. The best distance to have the lights from the specimen is 10 to 20 centimeters (two to five inches).

The relative speed of the film will affect the exposure times significantly. While faster films will allow shorter exposures, the resultant grain makes them less desirable for this type of work. The best films to use are those that have exposure ratings of 25 to 125. To obtain the best depth of focus and sharpness of image, an aperture of f-11 should be used. This is particularly true when small specimens are being photographed and the camera to specimen distance is small. Under the above conditions, the best exposures are usually obtained between one and five minutes. Even after a set of test exposures has been made and a standard exposure has been determined, taking a photograph at twice the exposure and half the exposure is usually a good idea. Many times the difference in the fluorescence will not be detected until the film is processed. It will then be necessary to rephotograph those specimens where poor exposures were obtained.

The Prints

Once correct exposures are determined and production of final prints is begun, the negatives that will be used to make those prints should be copied to obtain innernegatives to make the final prints. The reason for making an innernegative is to get an image that will look like the original shell in the final print. If the final prints were made from the original negative, the final image of the fluorescence would appear to be reversed.

There are several methods to make the innernegatives. The first method is to contact print the negatives onto another strip or piece of film. Using this method, all of the work will need to be done in a completely darkened room, such as a photographic darkroom.

On an enlarger easel, lay out the film strip(s) or cut film that is going to be used for innernegatives, with the emulsion side up. Next lay negatives that are to be copies on top of the unexposed film, emulsion side down. Lay a very clean piece of glass over the assembly and then expose the setup with an enlarger. The exact exposure needed with any particular setup will need to be determined by trial and error. After the strips have been exposed, develop them using standard photographic techniques.

A second method for producing innernegatives is to use a slide coping device. This is usually a setup that is attached to the front of a camera, and the slide or, in this case, the film strip is placed in a slot at the front of the setup. The film in the camera is then exposed with a light coming from the front of the camera.

A third method that has worked well is to put the desired negatives in an enlarger and project them on the film plane of a camera. The best method to correctly focus the image on the camera film plane is first remove the lens from the body of the camera that is to be used for the copies. Without any film in the camera put a piece of white paper in the camera where the film would be and then close the back. Attach a cable release. Then lay the camera body under the enlarger and hold the shutter open with the cable release; this is usually done by first selecting "bulb" from the exposure choices. Focus the image onto the paper in the film plane. After the image is focused, lock the enlarger in place, then replace the paper with film and copy the negatives for the final prints. An exposure of $^{1}/_{125}$ of a second and the enlarger lens set at f-8 is usually a good starting point for correctly exposed innernegatives. If any enlargement of the image on the innernegative is required, the exposures will need to be longer if the same f-stop is used in the enlarger. Also, all exposures should be made at the same enlargement to avoid having to refocus the image between exposures. If cut film holders are available, the same method may be used by substituting the film holders for the camera body. With this method, the enlarger shutter, if it has one, needs to be used instead of the camera focal plane shutter. The advantages of the last two methods are the ability to be able to enlarge the image on the negative and to only copy those negatives that are needed for the final prints. Once the innernegatives are obtained, they can be printed by standard photographic methods to obtain the final prints.

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THE IMPORTANCE OF PROFESSIONAL IDENTIFICATION OF YOUR FOSSIL FINDS

by Leslie Newberry, from *The Fossil Chronicles*, Leslie Newberry, ed., 12/92

If you're like me, it's a long trip to Gainesville just to identify the fossils you've been collecting over the past year. We all put off the trip, rationalizing that it would probably be a waste of time when you already know what all of the fossils are that you've found recently. Or do you?

D.J. Bethea and a friend were meeting Gary Morgan at the Museum of Natural History in Gainesville last week. Since D.J. was going, she asked if I had anything I would like identified. I got out some of my plastic bags of recently collected river fossils (the "baggie" method of scientific storage) and started to sort through them. There were several unidentified toe bones (one with a curious knotted look), a canine tooth of some sort and several other oddities. I bundled them up, along with the collection information on each specimen and sent them off with D. J. to Gainesville.

When I arrived home from work that evening there was a message on my etlelphone recorder to call D.J. as soon as possible. It turns out that my "junk" bag turned up quite a few interesting finds. The "canine tooth" turned out to be the tooth of the Eocene crocodile *Charactosuchus*, which was previously unknown in the state of Florida. Other fossil finds included a Jaguar toe bone (the knotty one), a land tortoise hoof (yes, tortoises had hooves) and a cormorant toe bone.

The point is, I never would have known what I had if these fossils hadn't been professionally identified. So, the next time you catch yourself putting off that trip to Gainesville, think again. You never know what exciting discoveries might await you.

ed. note: Although this article was written with specific reference to Florida locations, I think the message applies universally.

HOUSE MEMBERS CO-SPONSOR FOSSIL BILL

by William F. Jud

U.S. Congressman Bill Emerson, Republican Representative from Missouri's 8th District, is the most recent House member to announce than he will co-sponsor the *Paleontological Resources Preservation Act of 1993* went he bill is introduced this fall.

"Congressman Bill Emerson's support for this legislation is deeply appreciated by the hobbyist rockhounds and the great majority of the geoscience community in America," says Fredericktown, Missouri, geologist Bill Jud.

In an August 18 letter to Mr. Jud, Emerson said: "Historically, nearly 80% of all scientifically significant specimens (of fossils) have been discovered by amateurs. Likewise, I believe a policy of open access for the collection of fossil resources on public lands needs to be preserved."

"This is contrary to most federal land management practices which have restricted access to resources in order to preserve them. The *Paleontological Resources Preservation Act of 1993* will establish clear guidelines to our federal Land Management agencies to provide greater access for fossil collecting on public lands. For this reason, I will cosponsor this measure, when introduced this fall, in hopes of serving the scientifically important amateur paleontological community."

The fossil bill was drafted by American Lands Access Association (ALAA) under leadership of its President, Jon Spunaugle.

"The introduction of S-3107," Mr. Spunaugle says, "known as the (Senator Max) Baucus paleontology bill, in the last session of Congress, made amateur fossil collectors aware of how quickly the right to pursue their hobby could be lost. The devastating effect that enactment of such a bill would have on their hobby and on the science of paleontology motivated us to write a reasonable, rational and workable alternative."

The ALAA bill is supported by all major amateur collecting groups, commercial collectors, and many academic paleontologists, including the American Federation of Mineralogical Societies, and the American Association of Paleontological Suppliers and its affiliates.

Prime Sponsors of the ALAA bill in the House are Tim Johnson (D,SD) and Joe Skeen (R,NM). Besides Congressman Bill Emerson (R,MO) other House co-sponsors are Bill Brewster (D,OK), James Oberstar (D,MN) and Scott McInnes (R,CO). Five other Representatives and six Senators are also considering co-sponsorship.

Marion Zenker, Administrative Assistant at the Black Hills Institute of Geological Research at Hill City, SD, is coordinator of the effort to introduce the ALAA bill.

"Baucus bill supporters," says Ms. Zenker, "insist that we can preserve fossil resources by denying access to collecting those resources on public lands and imposing felony penalties for violations of the mandated system of licensing, permitting and policing those lands at phenomenal cost to the taxpayer. But fossils, if not collected, will eventually be destroyed by the natural processes of weathering."

"As citizens," Ms. Zenker continues, "we do not need huge numbers of bureaucrats acting as fossil police on hundreds of millions of acres of public lands in our country. The ALAA bill mandates that open access be encouraged and supported by the Land Management Agencies and could conceivably even generate monies for the agencies. That policy is best for the resource, best for the science and best for the public."

The Baucus bill includes fines of $100,000 and five years in prison for merely picking up a vertebrate fossil, a punishment worse than what is given to mid-level drug traffickers. The standard high school geology field trip could result in felony charges filed against the teacher, student and bus driver. Production of coal, cement and most building stone could be stopped. Highway and other construction projects which move rock would multiply in cost and

completion time as a government paleontologist shuts down operations to check for fossils as each new layer of rock is exposed.

"The existing system of cooperation among professional and amateur collectors has run smoothly for more than a century and does not need legislative tinkering," says Dr. Bruce Stinchcomb, Professor of Geology at Florissant Valley Community College in St. Louis, MO. The prevailing attitude of most geologists is that the system ain't broke and Baucus shouldn't be trying to fix it.

"It is encouraging to find that our Congressional Representatives such as Bill Emerson," notes Marion Zenker, "understand the tremendously important contribution that amateurs and others outside the academic community make to this fascinating and exciting science and how necessary it is to encourage that participation."

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A PRECOLUMBIAN FOSSIL COLLECTOR?
by B.L. Stinchcomb, Ferguson, Missouri

Why do people collect fossils? There are many reasons, such as: fossils are attractive, they are a link with megatime and many people are fascinated by them out of curiosity. Seemingly an interest and curiosity about fossils has been with people almost as long as there have been people, at least thinking, intelligent ones!

Fossils have been found associated with Native American (Indian) late ice age (Pleistocene) burial sites in the Midwest and other parts of the country. Trilobites (Utah), belemnites (S. Dakota) and ammonites (Montana, S. Dakota and other high plains states) have been found associated with Native American burial sites. To Native Americans, fossils often had, and still have, a religious connotation or significance, as the fossils associated with Indian burials imply.

In this light it is appropriate to recall an incident about twenty years ago in northeastern Arizona. We offered a ride to a Native American "thumbing" along Arizona highway 77 in northeast Arizona. Indians usually don't have a lot to say, particularly to non-Indians. This chap, however, was an exception; he was quite talkative. During our conversation, we showed him a set of fossil ferns from Missouri (St. Louis County) which I had taken with me to trade. He expressed a keen interest in these fossils, but in a manner which was unusual to us in dealing with fossils and which would be better defined as a reverence of the type usually associated with religious objects. His interest was so intense that I gave him some specimens which today are probably the only pieces of metropolitan St. Louis County residing somewhere on the vast Navajo Reservation where he lived.

The above incident in turn brings to mind a find of a number of years back when, during work on geologic mapping in Dade County, Missouri, at the western side of the Ozarks, some unique fossils were found. Near a sizeable spring (Bishop's Springs), on the edge of the spring branch were found the two illustrated worked flints. Both

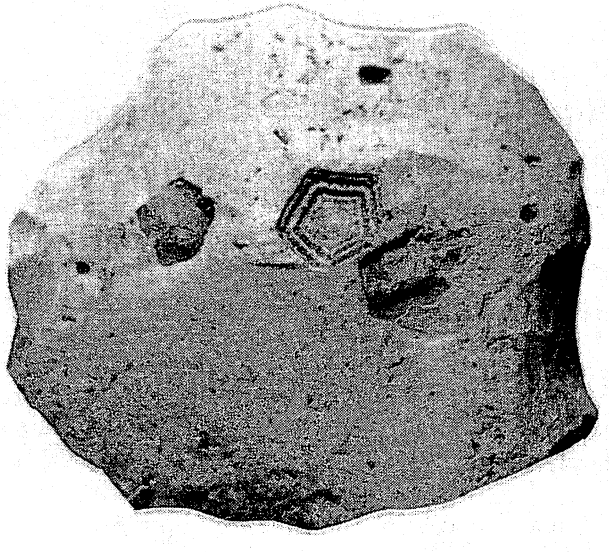
specimens were found close together. What makes these worked flints interesting is that both have fossils displayed in or near the center of the piece with the surrounding flint having been knapped. Were these specimens part of a fossil collection of some Native American one-two thousand years ago? Associated points found near Bishop's Springs of Late Archaic to Middle Woodland culture would suggest that this might be so.

Perhaps the person who found the fossils while knapping flints did the preparation on them while he was camped near the spring. Fossiliferous Mississippian chert and flint like that containing the fossils were favored by Native Americans for making "arrowheads" and scrapers, and these cherts surround the area. Perhaps in the case with these larger fossils, the maker used his flint knapping skills to "prepare" the fossils where they were placed in a central location on the flint pieces. Perhaps these pieces even formed part of a collection assembled while engaged at the springs--a collection which was forced to be abandoned when game migrations forced a relocation.

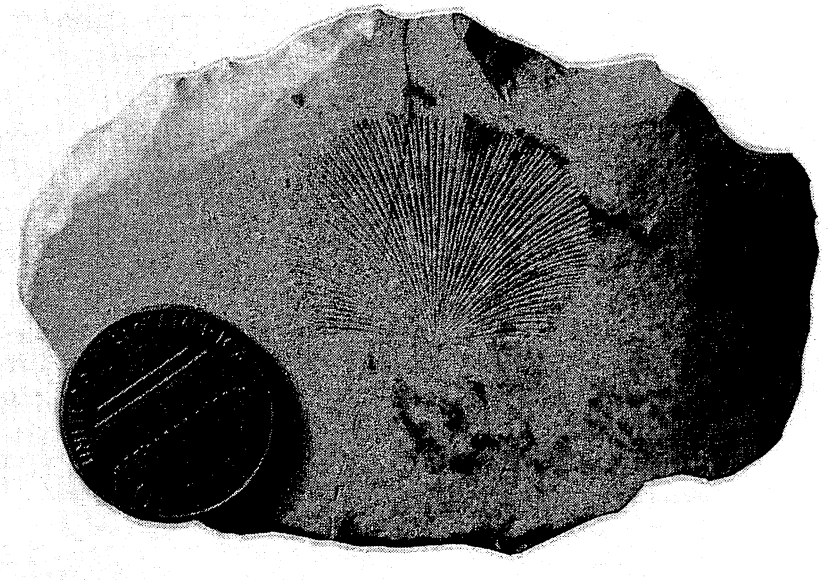
...

Perhaps the fossils were obtained as a consequence of collecting flints to be worked for projectiles (arrow heads). The fossils in the flint piqued the knapper's curiosity and a knapped border was placed around the fossils to highlight them. Perhaps they held some mystical or religious significance to the flint knapper, as the fern fossils apparently held for our ride-hitching, Arizona acquaintance.

Obviously, we shall never know the exact motivation behind collecting and working the ancient knapped fossil-bearing-flint specimens (ancient by our standards of time, negligible with respect to geologic time). Perhaps the interest in these fossils was the same as that manifested by present-day fossil collectors, which might summarily be stated as "fossils are neat!"



Knapped flint with impression of pentagonalbasal plate of camerate crinoid.



Knapped flint with impression of brachial valve of the brachiopod Schuchertella. *Mississippian chert, Bishop's Springs, Dade Co., MO.*

DIRECTIONS FOR MIXING AND USING BUTVAR B76

by Russ McCarty

from Florida Paleo. Soc. Newsletter, Winter/93, via Paleo Newsletter, Jean Wallace, ed.

Butvar, Monsanto's trade name for polyvinyl butyral, is a white crystalline plastic related to PVC. B65, the grade of Butvar sold by the Florida Paleontological Society, can be dissolved in acetone or ethyl alcohol (not isopropyl, methyl, or any other type of alcohol). Acetone is the preferred solvent for most uses because it dries quicker than alcohol. If a vat of preservative is needed to soak large specimens, health considerations might dictate the use of the less toxic solvent, ethyl alcohol. In its dry state, Butvar poses few health hazards (unless you try to eat it); however, when it is made into a glue or preservative, the solvents can be hazardous, especially acetone. When used in large quantities (e.g. brushing a gallon of preservative on a mastodon skull), the fumes will cause health problems if adequate ventilation is not provided. Acetone is also **extremely flammable**, and its fumes can be explosive; therefore, it should never be used around open flame, cigarettes, or spark-producing electrical stirring devices.

1) To make Butvar into a glue, fill an empty wide-mouth jar about 3/4 full with acetone. At the Florida Museum of Natural History, Russ McCarty sues a one-gallon glass jar like those in which restaurants get pickles (note that acetone will dissolve most plastics except lab grade plastics like Nalgene). The 1 lb. bag of Butvar sold by FPS will make about a gallon of glue, or two gallons of preservative.

2) While continually stirring, ad Butvar crystals until a viscous consistency is obtained (like model airplane cement). A one-pound bag will produce this consistency when mixed with 3/4 of a gallon of acetone. Even with constant stirring, there will be clumps of undissolved Butvar in the glue; however, if you cap the jar and let it set overnight, these clumps will dissolve. The mixture may be thinned or thickened by adding acetone or Butvar crystals.

3) To use as a glue, apply to both dry surfaces to be glued and blow on them or allow to air dry for 30 seconds. Press the pieces together firmly and hold for a minute or two. A sand box, clay, or a piece of tape can be used to hold pieces together while drying. Butvar glue is good for repairing small bones, but where strength is needed for large specimens, or for small specimens with minimal contacts, a stronger glue such as epoxy is recommended.

4) To use as a preservative or hardener, the user must first determine that the specimen is dry. When applied to wet specimens, Butvar hardener forms a white film on the surface of the specimen and will not preserve the specimen. To be an effective preservative, the mixture must be thin enough to penetrate the bone and get the dissolved Butvar deep into the specimen. Overly thick hardener will merely form a skin on the bone surface and will peel of later. Brush several coats of preservative onto the specimen. An alternative method is to make a wire-mesh cradle and dip the specimen into a container of hardener.

5) It is often more convenient for the user to mix the Butvar first as a glue and store this as a stock solution in a jar. When hardener is required, a portion of the glue stock can be poured off into another jar and mixed 50/50 (or to the proper consistency) with acetone. Since acetone readily evaporates from the mixtures, it is necessary to periodically replace the lost acetone in order to maintain the desired consistency. Butvar glue and hardener can be removed with acetone.

ADVERTISING SECTION

A LIVING FOSSIL FIND?
by Rocky Manning
from *The Fossil Record*
Rocky & Gail Manning, eds., July, 1993

Noel Dilly, one of the world's leading authorities on pterobranchs (colonial animals similar to coral), may (be the) discoverer of a living fossil. In 1992, Dilly was examining pterobranchs taken from the seafloor near New Caledonia. He observed that the organisms (or zooids) were from 1/25 1/10 inch long, fatter than the door to their cuplike homes, capable of squeezing out and climbing needlelike spines many times the length of their bodies. The needlelike spines were very similar to the nema found on graptolites; in fact, they were indistinguishable under an electron microscope.

It has been suggested that pterobranchs are related to graptolites, but no one had seen the spines before. Dilly's discovery removes the last objection. We will soon see if other objections surface or if the pterobranchs are generally recognized as graptolites.

Please ADD the Following NEW OR REJOINING MEMBERS to Your Directory:

Richard & Sunday Antrim 3715 170th St. NE Solon, IA 52333 319-644-3927	Director of R & D Programs--Genencor Intern./Homemaker. Interested in all fossils.
Dr. Richard J. Batt 305 North Avenue North Tonawanda, NY 14120 716-878-4736	Assistant professor at Buffalo State College: in paleo., stratigraphy, hydrogeology. Has PhD in paleo and 2nd MS in hydrogeology. Research interests include ammonite paleoecology, and high-resolution stratigraphy and paleoecology of Middle Dev. rocks in western New York. Member of Hamburg Natural History Soc., a group developing a "fossil park."
Mike Bruggeman 3820 Ferncliff Rd. Atlanta, GA 30278 404-985-1030	Pest control tech. Will not trade. Major interest invertebrate fossils, esp. trilobites and molluscs. Interested in learning more about fossils.
Randall W. Coleman 1716D Wildberry Glenview, IL 60025 708-486-8433	Jr. High Science Teacher. Will trade. Major interest Mazon Creek fossils. Not much to trade at present. Interested in meeting people who share interest in fossils.
Dave B. Corner 551 N. Ridge Av. #3 Arlington Heights, IL 60004 708-590-0168	Interested in contacting local people about good areas for amateurs to dig legally and productively, and in collecting and disseminating amateur dig news over CompuServe. Wants to help people get the latest news on areas that have become accessible or are no longer accessible, and disseminate any relevant news about local clubs to contact.
Kieran M. Cummins RR-2 Box 53 Skidmore, MO 64487 816-939-2360	Rural letter carrier. Will trade. Varied collection, but most is amber, teeth, & some Pleistocene collected locally. Wants to meet people interested in fossils.
Sarah M. Deutsch 7781 Lakeview Drive Burlington, WI 53105 414-539-3437	Student. Will trade. Collecting since 1987 (at age 7). Membership is birthday present. HAPPY BIRTHDAY, SARAH (sorry it's late).
John W. Good 1891 Windward Ln Hanover Park, IL 60103	Manufacturing System Analyst. Major interest Mazon Creek.
Roy E. Gustafson 11 Deer Run Road Orion, IL 61273 309-526-3592	Engineer. Interested in all types of fossils
Patrick Hackett 1727 Schaeffer Road Knoxville, TN 37932 615-691-8687	Veterinarian. Will trade. Major interest Ordovician trilobites. Has for trade various items. Member American Paleo. Soc. Wants to share knowledge and experience.

Richard B. & Miriam J. Hoover
7706 Teal Dr.
Huntsville, AL 35802
205-881-5633

Astrophysicist at NASA/Marshall Space Flight Center/ Free Lance Writer. Major interests ammonites, trilobites, crinoids, blastoids, fish & micros (esp. diatoms). Have one of largest private collections of diatoms in N. Amer. Have for trade Cret. ammonites from TX and OK, Miss. trilobites, blastoids, brachiopods, crinoids, coral and rare sponge material fm. N. AL; Ord. graptolites from central AL (fine slabs)

Susan Lyon
17 West 771-14th Street
Villa Park, IL 60181
708-834-4920

General manager--Electronic Imaging. Will trade. Major interest Braidwood-Pit 11-Morris Specimens. Has for trade Mazon Creek Biota--Carbondale Formation; Tullimonstrum gregarium, Octomedusa peickorum, cyclus americanus, Kalidecthes richardsoni, Mamyorcaris jaskowski, Esconites zelus, Fossundecima koneciorum, Esconichthys. Member Northeastern Ill. U. Mazon Creek Project since 1985.

Steve Poitras
322 S. Ridge
Liberty, MO 64068

John H. Weber
2530 N. 28th Place
Phoenix, AZ 85008
602-955-9295

Retired. Will trade. Major interest invertebrates (brachiopods, coelenterates, bryozoans, etc.). Wants to gain information on publications, to ex- change with collectors and to receive Digest.

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The Mid-America Paleontology Society (MAPS) was formed to promote popular interest in the subject of paleontology; to encourage the proper collecting, study, preparation, and display of fossil material; and to assist other individuals, groups, and institutions interested in the various aspects of paleontology. It is a non-profit society incorporated under the laws of the State of Iowa.

Membership in MAPS is open to anyone, anywhere who is sincerely interested in fossils and the aims of the Society.

Membership fee: One year from month of payment is $15.00 per household. Institution or Library fee is $25.00. Overseas fee is $15.00 with Surface Mailing of DIGESTS OR $25.00 with Air Mailing of DIGESTS. (Payments other than those stated will be pro-rated.)

MAPS meetings are held on the 1st Saturday of each month (2nd Saturday if inclement weather). October & May meetings are scheduled field trips. The June meeting is in conjunction with the Bloomington, IN, Gem, Mineral, Fossil Show & Swap. A picnic is held the fourth weekend in July. November through April meetings are scheduled for 1 p.m. in the Science Building, Augustana College, Rock Island, Illinois. One annual International Fossil Exposition is held in the Spring.

MAPS official publication, MAPS DIGEST, is published 9 months of the year--October through June.

CYATHOCRINITES

MID-AMERICA PALEONTOLOGY SOCIETY

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